pp 11 - 12: "Particularities of QSO's via Satellites," by L/eonid/ Labutin, UA3CR. (Extensive summary, not literal translation.)

Some of the general recommendations and rules for conducting satellite QSO's given in RADIO #1/1979 are repeated here:

--A lay-over (transparency?) /? -- planshet/ containing a path diagram should be prepared (RADIO #3/1982);

--A timetable of satellite passes over a specific geographical point should be drawn up;

--An overall evaluation should be made of reception conditions, and one should not go on the air if the signal level of the satellite is too low since this will only use up a communication channel for no good purpose;

--Both receiver and transmitter must have well-graduated scales, substantially reducing the time needed to search for one's own signal;

--The receiver must have smooth .. tuning, permitting the tracking of frequency necessitated by the Doppler effect;

--The transmitter power must be able to be regulated over a broad range;

--Call CQ in 12 - 15 second bursts with pauses of the same length --- in the majority of cases you will be called during your transmission since communication via satellite is duplex; on hearing a call you should stop transmitting.

There exist several specific particularities relating to operation via the "Radio-3" through "Radio-8" satellites, principally relating to the presence of regular signal fluctuations characterized by a period of 0.5 - 1 second and a dip of over 20 dB.

WHEN TO OPERATE VIA THE SATELLITES

To select optimal conditions for satellite operation, one should monitor the regular fluctuations caused by the satellite's rotation around its own axis (in the course of which the directivity pattern as well as the receive and transmit antenna polarization planes rotate) and also by the rotation of the radiowave polarization plane in the ionosphere (the Faraday effect) and other factors. The rotation axis of the satellite maintains the same position over an extended period of time thanks to the gyroscope effect.

To get a clear idea of the phenomena governing the regular fluctuations in the radio signal, it is necessary to form a precise picture of the movement of the satellite around the Earth and its rotation around its own axis. Let us examine several possible combinations of the position of the satellite's own rotation axis and the orbital plane, and also examine how the receive signal level changes as a function of this. (We shall not for the time being consider the turning of the satellite's receiving antenna, which is legitimate in monitoring beacon signals. The turning of the satellite's receiving antenna will produce analogous changes in the signal received by the satellite, and in the repeater mode fluctuations will be determined by the sum of the inequalities in the satellite's receiving and transmitting antenna patterns.) We shall assume that the satellite's transmitting antenna has a distant directional pattern /? -- prostranstvennaya diagramma napravlennosti/ similar to a toroid dipole, with minimum radiation along the axis of the dipole and maximum radiation perpendicular to it.

1. The satellite's own rotations axis coincides with the axis of the transmitting dipole and is perpendicular to the plane of the satellite's orbit (fig. 1). In this case regular changes in the signal are not observed, and the signal level mainly depends on the inclined distance /? -- ot naklonnoy dal'nosti/ (the straight distance between the Earth station and the satellite) and may vary within 9 dB in zenith orbits.
2. The satellite's own rotation axis coincides with the axis of the dipole and lies in the plane of the satellite's orbit (fig. 2). When the satellite passes through the communication zone the antenna turns continuously /? -- plavno/ relative to an observer on Earth. A related phenomenon is that a minimum signal will be observed at every geographical point along the subsatellite path, at a specific time, for example at point A -- when the satellite is at the Zenith, and at point B -- when it is at the horizon.
3. The satellite's own rotation axis is perpendicular to the axis of the dipole and to the orbital plane (fig. 3). Given this arrangement, a change of signal level is observed with a frequency of twice that of the satellite's rotation about its own axis. The change in the signal is at a maximum along the subsatellite path and lessens as the distance from the path increases.

4. The satellite's own rotation axis is perpendicular to the dipole's asis, and lies in the satellite's orbital plane (fig. 4). Under these circumstances the amplitude of regular fluctuations varies continuously. At point A maximum fluctuations will be observed when the satellite is at its highese point, while at point B they will be observed as it enters and leaves the communication zone. When the satellite is at its highest point, fluctuations at point B may be minimal, being determined by the rotation of the antenna's polarization plane only. If this case is examined from the point of view of the receiving antenna on board the satellite, it becomes clear that precisely in this situation is is easiest of all to communicate with the robot and to record information on the bulletin board.

The above data are approximate only, having been gathered using simple antennas and receiving equipment. A multitude of possible intermediate situations exists, involving a more complicated calculation of signal-level changes. Deep and frequent fading /zamiraniya/ occurs also as a result of the mechanism of radiowave propagation and the satellite's movement in orbit; here not only the amplitude of the fading changes but also the period, which differentiates this phenomenon from fading due to the rotation of the satellite.

A relatively stable and slowly changing signal level from the satellite beacons implies that the satellite's own rotation exis is close to the axis of the transmitting dipole. Monitoring of signals that have passed through the repeater and of the robot's reaction to incoming signals are indications that the receiving antenna is rotating in a plane perpendicular to the satellite's own (as described in cases 3 and 4). The more such monitoring results are accummulated, the more precisely it will be possible to determine the interrelationship between the satellite's rotation axis, its antennas, and the orbital plane, and hence the most facorable orbits for radiocommunication.

OPERATION THROUGH THE REPEATER

Telegraph signals suffer least of all under conditions of deep fluctuations. Practice shows (and theory proves) that the stronger the fading and the weaker the signal, the slower the sending must be. A sending speed of 60 - 70 characters per minute may be considered normal, only occasionally increasing it to 100 cpm, and when working QRP dropping to 40 - 60 cpm.

The power radiated toward the satellite must be regulated in such a way as to avoid the peak level of the repeated signal from exceeding that of the telemetry beacon. When this is exceeded, the ARU /meaning unknown - Tr./ system of the repeater begins to operate, and the signal lever of the remaining station will "breath" in synchrony with the turning of the satellite and with keying of the powerful station. The level of its own signal will change slightly.

Fluctuations affect the intelligibility /razborchivost'/ of SSB signals substantially more. Sometimes whole words disappear. Hence when there are deep fluctuations it is advisable to pronounce words slowly, drawing them out as in a drawl, repeating the most important parts several times.

COMMUNICATION WITH THE ROBOT

Conducting a QSO with the robot is the most complicated procedure.

In order for an operator to have a QSO with it, all others must stand by patiently. The slightest interference can interrupt a QSO. Often operators create interference by tuning their transmitters on the robot's frequency. Correct operation presupposes the presence of a well calibrated transmitter exciter /vozbuditel'/ or a digital frequency meter and a table or graph showing the Doppler frequency shift. Variance from the calculated frequency should be exceed ± 0.5 kHz.

For ease of operation, the nomogram shown in fig. 5 gives the values of the Doppler frequency shift as a function of the orbit characterized by a maximum elevation angle , and of the position of the satellite in orbit, which depeds on the time T from the moment of its appearance over the horizon. The extreme /left and right/ vertical lines indicate the time in minutes following or preceding the passing of the satellites through the traverse (the shortest distance between the satellite and the Earth station). To find the Doppler shift at a given moment in time, it is necessary to draw a straight line connecting the proper time on the extreme /left and right/ vertical lines. The intersection of this line with the center vertical lines will show the Doppler shift (and the elevation angle). The frequency shift is to be subtracted from the nominal frequency of the Earth transmitter if the satellite is moving from its appearance to the

traverse, and is to be added if it is moving from the traverse to disappearance. To make a contact with the robot, it is necessary to fulfill the following conditions:

--There must be no interference is the receive channel exceeding the threshhold of the satellite receiver;

--the signal level from Earth must exceed the activization threshhold /porog srabatyvaniya/ of the satellite receiver;

--the signal's frequency must be situated in the passband of the satellite receiver;

--sending must be precise and without error.

If due to fluctuations the radiated power cannot compensate for dips /provaly/ in the antenna directivity diagram, it is necessary to stop trying to communicate with the robot in order not to bother others.

--it's necessary to observe the correct procedure for calling the robot; for example "RS5 DE UA3XBU AR," and by the way the combination AR is sent together /slitno/. If the call is received incorrectly by the robot, either no answer will follow or an answer will be given in the form of a coded phrase. If the robot received the call correctly, it answers, for example, thus: "UA3XBU DE RS5 UR QSO NR 012 UA3XBU DE RS5 NR 012 OP ROBOT TKS FR QSO 73 SK." With this the communication is ended, and you should not send the robot 73, thanks for the QSO, goodbye, etc., thereby occupying the channel and bothering others. The robot enters your call-sign in the on-board log, and during the regular "dumps" from the on-board log on command from Earth you may check on the correctness of the QSO. The capacity of the on-board log (its electrical memory) is 64 communications, and its memory capacity for numbers is 999. During the transmission by the robot of CQ don't tune in its receive channel, thus creating interference. During the robot's reply, its receive channel is switched off, so that tuning in this channel is all the more useless.

Communication with the robot may be conducted if the call-sign of the station calling consists of not less than four and not more than six characters. MHz

The nominal input frequencies of the robots are 145.828 MHz for RS-5 and 145.836/for RS-7.

pp 13 - 14: "On a Volunteer Basis," by A. Gorokhovskiy.

The Xth Session of the "Intersputnik" Council was held /from 19 to 27 October 1981 according to a QSL card for special-call amateur station OKØISK reproduced with the article/ in the city of Brno, one of the largest industrial centers of Czechoslovakia. As at the previous annual sessions, the usual current matters were discussed, reports heard, and new tasks set forth; this year the tenth anniversary of the organization was celebrated. In this connection, a radioamateur club bearing the name "Intersputnik" was organized, headed by deputy minister of communication of Czechoslovakia Irzhi Yra /all Czechoslovak names are subject to distortion due to transliteration into Cyrillic characters from Latin characters in the course of preparing the article, and then back to Latin characters again in preparing this summary translation - Tr./, the head of the Czechoslovak delegation to the Xth Session. Naturally, the club had its own station, operating with the special call-sign OKØISK /presumably from "InterSputniK" -- Tr./, whose senior operator was well-known shortwaver Zdenek Proshek, OK1PG, from Prague, assisted by local shortwavers Yaromir Khanzal, OK2BGG, Miroslav Mikula, OK2PGM, and Andrey Oravets, OK3AU. You could come almost at any time to the station, situated on the 10th floor of the hotel, and a knock on the door would be answered by a welcoming "come in" since someone was on duty practically around the clock. Delegates to the session could also conduct communications via the amateur station -- all of them were elected members of the "Intersputnik" radioclub with the right to operate at the station. ... The head of the Soviet delegation, deputy minister of communication Yu/riy/ B/orisovich/ Zubarev, visited the station and conducted several QSO's with Soviet radioamateurs. Czechoslovak shortwavers, knowing that the launching of new amateur communication satellites was being readied in the Soviet Union, hoped this event would occur on the eve of the opening of the session; the Soviet delegation asked them to be patient a bit longer. /The remainder of the article describes an electronics club operated on a volunteer basis./

pp 15 - 16: CQ-U. VHF/UHF/SHF. 144 MHz -- EME-QSO's. Full Translation.

"For a long time it was thought that EME-contacts were realizable only if there were sufficiently great transmitter power and that because of this they were practically unrealizable for many radioamateurs. But now in the foreign press ("DUBUS" #4/1981) there has appeared an interesting report. The well-known EME-communication enthusiast K1WHS, with his "super-antenna" -- 24 x 12 elements -- has received his own signals, reflected from the Moon, using a transmitter power of 5 Watts. He's convinced that under favorable conditions the same is possible with a power of 1 Watt. Let us add that receiving one's own signal is not necessary to carry out communications, if the equipment of the other station has high energy potential.

"The ranks of adherents of this type of communication are growing fast. Ultra-shortwavers, developing more complicated antennas, are adding significantly to their successes. After putting up a 4 x 16-element antenna, UR2RQT, during the "window" (8 - 11 January) to North America, opened up a lunar-communication account by working K1WHS, then contacted VE2DFO, VE7BQH, and KI7D. With this, EME-contacts have already been conducted by radioamateurs in six union republics.

"And how did the others operate? Somewhat earlier, on 2 January, the second lunar communication was established within the USSR: UA3TCF - UA1ZCL. Success came only after the seventh (!) try. A week later UA3TCF recorded in his log new contacts with WB5ERD, VE2DFO, KB8RQ, and DJ5DT. He heard many other stations from VE, W/K, DK, YU, SM, and OK.

"Especially successfully did UB5JIN take advantage of the favorable conditions afforded by the "window." He contacted SM7BAE, SM5FRH, DK4XI, WA1JOF, KI7D, VE2DFO (up to 10 dB), OH7PI, WA1JXN, and N4PZ. A large portion of the contacts was established without skeds.

"On 10 January the third communication within the USSR occurred: UB5JIN - UA1ZCL. It is pleasant to note the success of UA1ZCL, who, notwithstanding his remoteness from centers of ultrashortwave activity, has traveled the distance from his first contact via "aurora" to EME! UA1ZCL used an 8 x 7-element (4-level) antenna with a gain of 19 dB and a preamplifier using a KP307G transistor and with a noise coefficient of 1 dB.

"On 11 January a tremendous QSO took place between UB5JIN and K1WHS (the signal got up to 17 dB). Besides the exchange of necessary data, the operators informed each other about their equipment and antennas. UB5JIN also had contacts with K1MNS and VE7BQH.

"During the next "window" to the USA (5 - 7 February) Soviet ultrashortwavers established about 20 transcontinental ultrashortwave contacts. UA3TCF had three QSO's, UB5JIN five. UR2RQT continued to acquire lunar communication experience. This time he entered QSO's with WA4LYS, WB5ERD, K1MNS, WA1JXN, K1WHS, and W5LUU in his log.

"UA3LBO contacted WA1JXN, K1MNS, W5UN, and N7NW. This brought him to ten EME-QSO's, and he monitored roughly 25 stations from W/K, VE, SM, F, OK, GW, DK, Y, UA3, and UA1.

"UG6AD, after putting up a new F9FT 2 x 16-element antenna rotating in two planes, contacted SM7BAE and K1WHS. He heard also a series of stations in the USA and Canada.

" UA1ZCL worked WA1JXN and WA9KRT.

"UO5OGS continued his earnest attempts to establish EME-contacts. On 7 February he copied K1WHS well, but didn't have time to complete a QSO -- the Moon went behind the horizon.

"And now concerning the active-operating period of 5 - 8 March. Another Moon communication enthusiast appeared -- RA3YCR. He had six QSO's straight away with the stations that have become traditional for our ultrashortwavers: K1MNS, VE7BQH, K1WHS, WA1JXN, KI7D, and SM7BAE...

"UA3TCF contacted N4PZ, LA1TN, WA4NJP, Y22ME, G3POI, and WAØLSH. Monitoring for other stations in the segment 144.000 - 144.100 MHz, he heard YV5ZZ (up to 3 dB) from Venezuela, who was trying to have a QSO with Y22ME. This was an extremely rare observation, since representatives of other continents, besides North America and Europe, are little active in EME communication on this band. And others /?/. UA3TCF continued his experiments on receiving "Moon" signals ona 15-element "beam" without a pre-amplifier. He succeeded in receiving signals from K1WHS (7 dB), VE2DFO, and DK4XI. The last, by the way, uses a 16 x 13-element F9FT antenna!

"Also active in March were UB5JIN (two QSO's), UA3LBO (four QSO's), UA1ZCL (four QSO's), and others."